REMARKS

By the present amendment, claims 13-16, 24, 26, 29 and 34 have been amended to obviate the examiner's objections thereto and/or to further clarify the concepts of the present invention. Among other things, claims 13 and 29 have been amended to include a gas supply line and a liquid supply line, support for which may be found in Figures 2 and 12 of the drawings. Entry of these amendments is respectfully requested.

In the Office Action, claims 13 and 29 were rejected under the second paragraph of 35 USC § 112 as being indefinite. In particular, it was alleged that these claims omit essential elements, that is, a gas supply and means for transporting liquid from the storage tank to the dissolution unit. Reconsideration of this rejection in view of the above claim amendments and the following comments is respectfully requested.

As noted above, claims 13-16, 24, 26, 29 and 34 have been amended to obviate the examiner's objections thereto and/or to further clarify the concepts of the present invention. It is submitted that the claims are now in conformance with the provisions of the cited statute. Accordingly, withdrawal of the rejection under the second paragraph of 35 U.S.C. § 112 is respectfully requested.

Some of elected claims 13-38 directed to solution preparation apparatus were rejected in a series of anticipation rejections. Specifically, these rejections were:

(1) Claims 13-15, 23, 29, 34, 37 and 38 were rejected under 35 USC § 102(b) as being anticipated by the patent to Nakajima et al.

(2) Claims 13-15, 20, 29, 34, 37 and 38 have been rejected under 35 USC § 102(b) as being anticipated by the patent to Nelson et al.

(3) Claims 13-16, 20, 23, 29, 34-35, 37 and 38 have been rejected under 35 USC § 102(b) as being anticipated by the patent to Nurmi et al.

(4) Claims 13-16, 23, 29, 34 and 38 have been rejected under 35 USC § 102(b) as being anticipated by the patent to Ginsburgh et al.

In making each of these rejections, it was asserted that the cited patent teaches each element of the apparatus as claimed. Reconsideration of these rejections in view of the above claim amendments and the following comments is respectfully requested.

Before discussing the above rejections in detail, a brief review of the presently claimed invention may be quite instructive. The apparatus as defined by independent claim 13 as amended includes a dissolution unit (22), a gas discharge control unit (23) and a liquid discharge control unit (24). As described on page 6, line 18 to page 7, line 3 of the subject specification, the gas discharge control unit and/or the liquid discharge control unit are operated at substantially the same time as the dissolution unit. Thus, a very pure

chemical solution is quickly prepared.

The apparatus as defined by independent claim 29 as amended includes a cooling unit (25, 82). In the case of using HCl gas that generates heat of solution, the dissolving rate of the gas is enhanced by the operation of the cooling unit. It is submitted that the apparatus as defined by the claims herein is not taught or suggested by the Nakajima et al Nelson, Nurmi et al and Ginsburgh et al patents cited in the above noted rejections.

More particularly, the Nakajima et al patent discloses a liquid chemical agent producing device in Fig. 1. The device includes a process tank 1 for storing a chemical agent, an over-flow tank 3 for receiving liquid chemical agent that overflows from the process tank 1, a circulation system 5 for returning the liquid chemical agent collected in the over-flow tank 3 to the process tank 1, a gas supply system 9 for supplying HCl gas to the circulation system 5, a pure water supply system 7 for supplying pure water to the circulation system 5, and a mixing unit 17 for mixing the HCl gas with the water to prepare liquid chemical agent, such as HCl solution.

The Nakajima et al patent discloses that a control system 70 controls mass flow based on the concentration (pH or absorption) of the liquid chemical agent. As described in column 5, lines 6-14, an electric motor operated valve 18 is connected to the mixing unit 17. The electric motor operated valve 18 is opened to discharge the HCl gas in the mixing unit 17 when the gas in the mixing unit 17 (a packed tower 27) reaches a predetermined

amount. A liquid outlet 17b of the mixing unit 17 is connected to an opening/closing valve 19 via a pipe conduit 11.

As described on column 6, line 49 to column 7, line 9 of the Nakajima et al patent, liquid chemical agent is prepared by first having all valves 19, 33, 49 and 59 in the closed position. Then, the opening/closing valve 19 is opened and circulation pump 13 is started to allow pure water to circulate in the circulation system 5. Then, a first opening/closing valve 49 on the gas supply system 9 is subsequently opened to supply HCl gas into the mixing unit 17.

The presently claimed invention can be distinguished from that taught by Nakajima et al patent at least in the following respects:

(1) The liquid discharge control unit (24) according to the present invention controls the discharge amount of the chemical agent from the preparation tank 21 as described on page 6, lines 23 to 30. In distinct contrast, the opening/closing valve 19 according to the Nakajima patent adjusts the returning amount of the chemical agent from the mixing unit 17 to the process tank 1. Thus, the opening/closing valve 19 differs from the liquid discharge control unit (24) according to the present invention.

not recited in claim

Maintain

(2) The gas discharge control unit (23) and/or the liquid discharge control unit (24) of the present invention are operated at substantially the same time as the dissolution unit

22. In contrast, the electric motor operated valve 18 and/or the opening/closing valve 91 are/is not operated at substantially the same time as the mixing unit 17. As described on column 6, lines 64-67 of the Nakajima patent, the opening/closing valve 19 is opened before supplying HCl gas to the mixing unit 17. The electric motor operated valve 18 is opened during or after supplying HCl gas to the mixing unit 17.

False

Put passage in Office action passage does not refer to 19 or 18

(3) The dissolution unit (83) as recited in claim 29 cools the chemical agent during preparation. In distinct contrast, the mixing unit 17 according to the Nakajima patent does not cool the chemical agent in the mixing unit 17. Therefore, the mixing unit 17 of the patent is distinctly different from the dissolution unit according to the presently claimed invention.

OK Withdrawn

For the reasons described above, it is submitted that the amended claims 13 and 29 and the claims dependent thereon are not anticipated by the Nakajima et al patent.

Fig. 1 of the Nelson patent discloses a system for producing ozonated water. Liquid 31 is supplied from a liquid source 4 to a pressurized vessel 2, the amount of the liquid 31 supplied being adjusted by valve 22. Oxygen gas is supplied from an oxygen gas facility 10 to an ozone gas generator 5 through an oxygen conduit 36. Ozone gas generated in the ozone gas generator 5 is supplied to the pressurized vessel 2 through a bubbler 32, which is located at the bottom of the pressurized vessel 2. A pressure regulator 15, a pressure gauge 11, a 2-way valve 12, and a mass flow controller 13 are arranged on the

oxygen conduit 36, these components 11-13 and 15 controlling the flow rate of oxygen gas. Cooling media 14 is supplied to the ozone gas generator 5 and exits through a drain 38.

As described on column 9, lines 5 to 15 of the Nelson patent, undissolved ozone gas is discharged from the pressurized vessel 2 through a gas outlet conduit 39, which has a pressure gauge 23 and a gas back pressure regulator 7. The gas back pressure regulator 7 maintains the pressure in the pressurized vessel 2 within a desirable range and the gas outlet conduit 39 is connected to an ozone catalyst which converts ozone to oxygen.

As described on column 10, lines 9 to 29 of the Nelson patent, ozonated water produced in the pressurized vessel 2 is dispensed from an outlet conduit 6. Excessive amounts of the ozonated water pass through a drain line 26 after the concentration is checked by a concentration sensor 27. A fixed orifice 28 limits the flow of the ozonated water passing through the drain line 26 such that excessive amount of water and ozone are not wasted as is set forth in column 10, lines 18-20.

The presently claimed invention differs from that taught by the Nelson patent at least with respect to the following:

Not mentioned in claims 13 or 29

(1) The discharge amount or the flow rate of the chemical agent from the preparation tank (21) according to the present invention is changed by the liquid discharge

control unit (24). In distinct contrast, the fixed orifice 28 of the Nelson patent only limits the flow of the ozonated water in the drain line 26, it does not alter the flow of the ozonated water in the drain line 26.

Claim 13 recites a liquid discharge control unit for .... see col 10 lines 17-30

(2) The gas discharge control unit (23) and/or the liquid discharge control unit (24) of the present invention are operated at substantially the same time as the dissolution unit 22. In contrast, the fixed orifice 28 of the Nelson patent is fixed and is not operated. The pressure vessel 7 is opened after supplying ozone gas to the pressurized vessel 2 and therefore, the pressure regulator 7 and/or the fixed orifice 28 are not operated at substantially the same time as the pressurized vessel 2. In addition, the discharge amount of the undissolved ozone gas is not adjusted by the pressure regulator 7. False

see lines 48-59 col 9

(3) The dissolution unit (83) according to claim 29 cools the chemical agent during the preparation. In distinct contrast, the Nelson patent only shows cooling the ozone gas generator 5. The pressurized vessel 2 of the Nelson patent does not cool the chemical agent.

Change to 103 see col 2 lines 45-

For the reasons described above, it is submitted that the amended claims 13 and 29 and the claims dependent thereon are not anticipated by the Nelson patent.

Fig. 1 of the Nurmi patent discloses a system for generating a vapor saturated with a volatile liquid chemical such as a silane. The liquid chemical is stored in liquid containers

108, 110 and is supplied to a saturation vessel 106. The amount of the liquid chemical supplied is detected by a weight scale 148, which measures the weight of the saturation vessel 106. Controller 150 controls operation of the liquid supply system based on the weight measurement.

The Nurmi et al patent further teaches that a carrier gas, such as H_2, is delivered from a carrier gas source 102 through a carrier gas line 104 to the saturation vessel 106. A pressure regulator 172 arranged on the carrier gas line 104 adjusts the pressure (or the supplied amount) of the carrier gas entering the saturation vessel 106. As described on column 5, line 58 to column 6, line 4 of the patent, fine bubbles of the carrier gas are formed by a gas dispersing structure 126 and are dispersed into the liquid chemical in the saturation vessel 106. The fine bubbles of the carrier gas contact the liquid chemical and become saturated with the chemical vapor. The saturated vapor is removed from the saturation vessel 106 through a third connection 134 and is conducted to the point of use, such as a concentration sensor or semiconductor processing tools, through a tubing 138 and branched lines 140, 142, 144.

As shown in Fig. 2 of the Nurmi et al patent, the third connection 134 is provided with a pressure relief assembly 136 which protects the saturation vessel 106 in the event of a high pressure condition and is connected to the point of use, such as a concentration sensor or semiconductor processing tools, through a tubing 138 and branched lines 140, 142, 144. As described on column 6, lines 36 to 45, the saturation vessel 106 has a fourth

connection 146 which includes a manual valve V6 through which remaining liquid chemical is removed from the vessel 106 when the vessel is to be serviced. A cooling unit 154 and a heater 130 maintain the liquid chemical in the vessel 106 at the desired temperature.

The presently claimed invention differs from that taught by the Nurmi et al patent in the following respects:

(1) The apparatus of the Nurmi et al patent produces saturated vapor by saturating the carrier gas with the liquid chemical. In other words, the product of the apparatus is wet vapor. In contrast, the product of the claimed apparatus is chemical solution. Therefore, the object and the function of the apparatus of the Nurmi patent is different from those of the presently claimed invention.

(2) In the Nurmi et al patent, the wet vapor is generated by saturating the carrier gas with the liquid chemical. In the present invention, the chemical solution is prepared by dissolving the chemical gas into the liquid.

(3) In the Nurmi et al patent, the liquid chemical stored in the vessel 106 is discharged through the fourth connection 146. However, the discharged amount is not controlled. Therefore, the Nurmi patent does not disclose an element corresponding to the liquid discharging unit 24 as presently claimed.

(4) According to the Nurmi et al patent, the pressure relief assembly 136 is activated according to the inner pressure of the vessel 106 and is not operated at substantially the same time as the vessel 106.

(5) In the Nurmi patent, the wet vapor (product) is discharged. In the present invention, undissolved chemical gas (raw material) is discharged.

(6) According to the Nurmi patent, the liquid chemical should have sufficient volatility and the carrier gas should be insoluble with the liquid chemical. In the present invention, a nonvolatile liquid can be used, and chemical gas having relatively high solubility can be used.

For the reasons as described above, it is submitted that amended claims 13 and 29 and the claims dependent thereon are not anticipated by the Nurmi et al patent.

The Ginsburgh et al patent discloses a mixing apparatus 10 for producing a controllable safety-enhanced fuel by mixing inert gas such as CO_2 with a hydrocarbon fuel. As shown in Fig. 1 of the patent, the mixing apparatus 10 has a mixing receptacle 20 and a sensor 78. Fuel 24 is introduced into the mixing receptacle 20 through fuel inlet 32 and a fuel control means 26 controls the supplied amount of the fuel 24. Inert gas 18 is injected in the mixing receptacle 20 through a gas inlet 30 and a gas control means 28 controls the injected amount of the inert gas 18. Gas-enriched (safety-enhanced) fuel is

discharged through a fuel outlet 36, an outlet control means 46 controlling the discharged amount of the gas-enriched fuel.

The presently claimed invention differs from the teachings of the Ginsburgh et al patent in the following respects:

(1) The apparatus of the Ginsburgh et al patent does not have a gas discharging control unit as claimed.

(2) As described on column 5, lines 50-54 of the Ginsburgh et al, the outlet control means 46 discharges the gas-enriched fuel as needed, and it is not operated at the same time of the gas dissolution.

For the reasons as described above, it is submitted that amended claims 13 and 29 and the claims dependent thereon are not anticipated by the Ginsburgh et al patent.

For all of the reasons stated above, withdrawal of the rejections under 35 U.S.C. § 102(b) and allowance of the rejected claims over the cited patents are respectfully requested.

Claims 21-22 were rejected under 35 USC § 103(a) as being unpatentable over the above patent to Nurmi et al. In addition, claims 20-22, 30-31 and 36 were rejected under

35 USC § 103(a) as being unpatentable over the above patent to Nakajima et al further in view of the '080 Japanese patent publication. In making these rejections, it apparently was acknowledged that the cited primary patents do not specifically teach the use of a nozzle to form bubbles, but it was asserted that any element such as a line allowing the escape of a gas may be termed a nozzle citing the Japanese patent publication. Further, it was acknowledged that the cited primary patents do not specifically teach the use of a deflection plate to control the flow of bubbles, but asserted that such a structure design is well known for controlling the flow of fluid in a circulation tank. Reconsideration of these rejections in view of the above claim amendments and the following comments is respectfully requested.

The above remarks relative to the above noted teaching deficiency of the Nurmi et al and Nakajima et al patents are reiterated here with regard to these rejections. It is submitted that the subject matter of these claims is not taught or suggested by the cited patents whether taken singly or in combination.

For the reasons stated above, withdrawal of the rejections under 35 U.S.C. § 103(a) and allowance of the rejected claims over the cited patents are respectfully requested.

Applicants acknowledge with appreciation the indication that claims 17-19, 24-28 and 32-33 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In view of the foregoing, it is submitted that the subject application is now in condition for allowance and early notice to that effect is earnestly solicited.

In the event this paper is not timely filed, the undersigned hereby petitions for an appropriate extension of time. The fee for this extension may be charged to Deposit Account No. 01-2340, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,

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Marked Up Version of Amendments to Specification and Claims

IN THE CLAIMS:

Please amend claims 13-16, 24, 26, 29 and 34 as follows:

13. (Amended) A chemical solution preparation apparatus comprising:

a gas supply line for supplying a chemical gas:

~~a preparation tank for storing~~ a liquid supply line for supplying a liquid, which is one of pure water or a mixture having a predetermined composition;

a dissolution unit for dissolving ~~a~~ the chemical gas in the liquid; and

at least either one of a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid by the dissolution unit and a liquid discharge control unit for discharging a predetermined amount of the chemical solution from the ~~preparation tank~~ dissolution unit, wherein one of the gas discharge control unit and the liquid discharge control unit is operated at substantially the same time as the dissolution unit.

14. (Amended) The preparation apparatus according to claim 13, wherein the dissolution unit includes a preparation tank for receiving the liquid from the liquid supply line and a gas supply unit for forming bubbles of the chemical gas in the preparation tank to dissolve the chemical gas in the liquid.

15. (Amended) The preparation apparatus according to claim 13, ~~wherein the gas supply unit includes a first pipe for supplying the chemical gas to the preparation tank and~~ further comprising a flow controller arranged in the ~~first pipe~~ gas supply line.

16. (Amended) The preparation apparatus according to claim ~~13~~ 14, further comprising a cooling unit for cooling the liquid in the preparation tank.

24. (Amended) The preparation apparatus according to claim 23, wherein the concentration measuring device includes at least one of a viscosity meter, a specific gravity meter, an ultrasonic wave velocity meter, and a specific conductance meter, and wherein the concentration of the chemical solution from the measured result of the concentration measuring device and controlling the amount of the chemical gas supplied to ~~the preparation tank~~ the dissolution unit from ~~the dissolution unit~~ the gas supply line in accordance with the calculated concentration.

26. (Amended) The preparation apparatus according to claim 24, wherein the gas supply line includes ~~the chemical gas is contained in~~ a container in which the chemical gas is contained, and wherein the concentration measuring device calculates the amount of the used chemical gas by measuring the change in the weight of the container and calculates the concentration of the chemical solution from the amount of the used chemical gas.

29. (Amended) A chemical solution preparation apparatus comprising:

a gas supply line for supplying a chemical gas;

a liquid supply line for supplying a liquid;

a dissolution unit for dissolving ~~a~~ the chemical gas in ~~a~~ the liquid to prepare a chemical solution and cooling the chemical solution during the preparation; and

a gas discharge control unit for discharging an adjusted amount of the chemical gas that was not dissolved in the liquid by the dissolution unit.

34. (Amended) The preparation apparatus according to claim 29, further comprising ~~a pipe for supplying the chemical gas to the dissolution unit and~~ a flow controller arranged in the ~~pipe~~ gas supply line.